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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/724,436	11/28/2000	Eshel Ben-Jacob	A33795	6759

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NEW YORK, NY 10112

EXAMINER

MARSCHER, ARDIN H

ART UNIT	PAPER NUMBER
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1631

DATE MAILED: 09/23/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b> 09/724,436	<b>Applicant(s)</b> BEN-JACOB ET AL.	
	<b>Examiner</b> Ardin Marschel	<b>Art Unit</b> 1631	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 02 February 2004 and 23 June 2004.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 13-29 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 13-29 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input checked="" type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. <u>5/19/04</u> . |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)                                   |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date <u>(1 sheet)</u> . | 6) <input type="checkbox"/> Other: _____.   |

### **DETAILED ACTION**

Applicants' arguments, filed 6/23/04, directed to the issue of presentation of claims drawn to a non-elected invention has been found persuasive. Albeit significantly new wording of the claimed subject matter, the newly submitted claims, submitted 2/2/04, are deemed to be reasonably directed to the invention elected by original presentation. The non-responsiveness indicated in the Office action, mailed 4/20/04, is therefore hereby withdrawn. Pending instant claims 13-29 are under examination.

Applicants' arguments, filed 2/2/04 and 6/23/04, have been fully considered but they are not deemed to be persuasive. Rejections and/or objections not reiterated from previous office actions are hereby withdrawn. The following rejections and/or objections are either reiterated or newly applied. They constitute the complete set presently being applied to the instant application.

### **TITLE**

The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed. As previously indicated, the present title fails to significantly cite the claimed subject matter. For example, a generic method is set forth in the title, whereas in contrast, only claimed method is a specific method of manufacturing a circuit. Also, only transistors, resistors, and circuits are claimed in contrast to the present title which indicates far more generic apparatus subject matter.

### **NEW MATTER**

Claims 13-28 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

NEW MATTER has been added via the citation of transistor element structure wherein the "active grain consists of a bare DNA segment" as in instant claims 13-28 either directly or via dependence from a claim which does specifically cite this "bare" limitation. It is acknowledged that the presence or absence of enzymes either for binding or for coating is described as filed. Such enzyme presence or absence, however, does not reasonably indicate that any DNA is "bare" per se. Additionally, the "bare DNA segment" limitation which is specifically directed to the active grain as in claim 13, for example, is not related to whether the other segments are bare or not. Thus, embodiments of claim 13 now include those wherein only the active grain is bare and not the other segments as well as embodiments wherein all of the segments of the claimed transistor are bare DNA segments. It is noted that the Figures, such as Figures 3B or 3C show what may be construed to be entirely "bare" transistors with all segments as in claim 13 being bare, but that the other embodiments now set forth in claim 13 wherein only the active grain is bare and not one or both of the other two segments being bare is not shown and thus is NEW MATTER.

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NEW MATTER has been added via broadening the resistor disclosure as set forth in claim 18. The claim cites transistors which are serially connected but does not indicate the accompanying limitation of being in series "until the resistivity reaches the desired value" as previously required in claim 8 as originally filed and now canceled. The broadening NEW MATTER in claim 18 therefore is the resistor subject matter without being limited by the above noted desired value resistivity limitation. Claim 28 also cites a resistor similarly broadened over what is originally filed due to lacking said desired value resistivity limitation.

NEW MATTER has been added via the claim 19 circuit containing a "plurality of repetitive single electron tunneling transistors" with a NOT gate. It is noted that claim 6 as filed cited a circuit of claim 1 comprising a NOT gate but that claims 1 and 6 lacked any tunneling limitation. This NEW MATTER is also present regarding the lack of a supporting "tunneling" limitation regarding the circuit now claimed in claim 22 and 23 via dependence from claim 22. Claim 20 is included hereinunder due to depending from claim 19 thus also containing the above NEW MATTER. Claim 25 also cites the clock limitation but claim 11 as originally filed depends from claim 1 which does not cite the corresponding tunneling limitation as in claim 24 from which claim 25 depends.

Claim 21 cites a combination of three elements, a transistor, NOT gate, and resistor. This specific combination has not been found as filed and therefore is NEW MATTER.

### **VAGUENESS AND INDEFINITENESS**

Claims 13-29 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 13, line 1, cites the claim as being drawn to a transistor. The components listed in lines 2-4 of claim 13, however, are connected but without any limitations corresponding to a transistor functional relationship. This issue includes acknowledgment of the "active grain" limitation in claim 13 which lacks any particularity regarding transistor functionality. It is also acknowledged that the disclosure as filed describes transistor structure in Figures and related discussion but that the claims are not clearly limited to these specific structures as presently claimed nor stated as such in the specification by any specific definition of what an "active grain" is. Thus, the metes and bounds of the claim are vague and indefinite as to whether the preamble in line 1 controls them or whether lines 2-4 which merely cites connected segments without any particular function therebetween controls the metes and bounds. Clarification via clearer claim wording is requested. Claims which depend directly or indirectly from claim 13 also contain this unclarity due to their dependence. It is noted that claims 16 and 17 cite a hopping mechanism and a P-bridge, respectively, but without directing this mechanism clearly and concisely to a functional transistor relationship between the claimed segmented DNA. Claims 24-28 also cite DNA segments or parts but without any transistor functional structures therein and are equally vague and indefinite as discussed above.

Claim 17 is further vague and indefinite due to citing a "net charge" in line 3 which is reasonably deemed inclusive of a wide range of charge inclusive of single or multiple electron charges. This conflicts with the "single" electron characterization of the claimed transistor in line 1 of claim 17 thus supporting this basis for rejection.

Clarification via clearer claim wording is requested.

Claim 18 also contains the unclarity as described above for claim 13 due to lacking structural limitations that correspond to a resistor characteristic for the claimed resistor. Clarification via clearer claim wording is requested.

Claims 19-22 and 24-27 cite a "circuit" in their respective lines 1, but without setting forth any circuit connections which correspond to a circuit. A circuit is reasonably deemed to be composed of electrical elements which are connected together in some way so as to mediate current flow. No such current flow connection limitations are present in claims 19-22. Claim 19, for example, cites a plurality of transistors and a NOT gate but without any connection between them cited in the claim. Clarification via clearer claim wording is requested.

In claim 23, line 3, the phrase "the first DNA-based NOT element" is set forth but is lacking clear antecedent basis because no such specific "first" element has been previously cited in the claim. Similarly, claim 23, line 4, sets forth "the second DNA-based NOT element", however, there is no antecedent basis for such a "the second" element previously in the claim. Clarification via clearer claim wording is requested.

Claim 29 is vague and indefinite because “the coded edges” and “the active cores” in lines 22-23 lack antecedent basis for such specific “the” edges and cores previously set forth in the claim. Clarification via clearer claim wording is requested.

Claim 29 is further vague and indefinite because “the other edges” and “the wires” in line 40 lack antecedent basis for such specific “the” edges and wires previously set forth in the claim. Clarification via clearer claim wording is requested.

Claim 29 is additionally vague and indefinite because “combine to the nuclei” and “the network” in lines 41-42 lack antecedent basis for such specific “the” nuclei and network previously set forth in the claim. Clarification via clearer claim wording is requested. The word “combine” in line 41 also appears confusing as being awkwardly worded in context.

### **LACK OF ENABLEMENT**

Claims 14 and 29 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

Factors to be considered in determining whether a disclosure would require undue experimentation have been summarized in Ex parte Forman, 230 USPQ 546 (BPAI 1986) and reiterated by the Court of Appeals in In re Wands, 8 USPQ2d 1400 at 1404 (CAFC 1988). The factors to be considered in determining whether undue experimentation is required include: (1) the quantity of experimentation necessary, (2)



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the amount or direction presented, (3) the presence or absence of working examples, (4) the nature of the invention, (5) the state of the prior art, (6) the relative skill of those in the art, (7) the predictability or unpredictability of the art, and (8) the breadth of the claims.

The Board also stated that although the level of skill in molecular biology is high, the results of experiments in genetic engineering are unpredictable. While all of these factors are considered, a sufficient amount for a prima facie case are discussed below.

Both of claims 14 and 29 cite the material referred to as "M-DNA". Consideration of the entirety of the instant disclosure as filed has failed to reveal any guidance or even general description which would enable the preparation of "M-DNA". It is noted that page 10, lines 1-8, cite "M-DNA" but without indicating its source or method of preparation. Page 12, lines 5-7, cites Figure 3B as representing the "M-DNA" part of the molecule but without any definition of what "M-DNA" actually is or how it is prepared. A representation of "M-DNA" is not reasonably a disclosure of what it actually is. Thus, undue experimentation would be required to prepare such an uncharacterized material without some type of specific guidance, which has not been supplied in the instant disclosure as filed.

Claims 13-29 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

Factors to be considered in determining whether a disclosure would require undue experimentation have been summarized in Ex parte Forman, 230 USPQ 546 (BPAI 1986) and reiterated by the Court of Appeals in In re Wands, 8 USPQ2d 1400 at 1404 (CAFC 1988). The factors to be considered in determining whether undue experimentation is required include: (1) the quantity of experimentation necessary, (2) the amount or direction presented, (3) the presence or absence of working examples, (4) the nature of the invention, (5) the state of the prior art, (6) the relative skill of those in the art, (7) the predictability or unpredictability of the art, and (8) the breadth of the claims.

The Board also stated that although the level of skill in molecular biology is high, the results of experiments in genetic engineering are unpredictable. While all of these factors are considered, a sufficient amount for a prima facie case are discussed below.

Claim 13 cites the limitation "single electron tunneling transistor" in line 1. Nowhere in the instant disclosure as filed has there been any guidance that enables "single electron" practice for tunneling, circuitry, or otherwise. Current detection in a transistor, resistor, or circuit is well known to generally occur via the movement of a multitude of electrons rather than via a single electron process. Also, well known physical limitations on detection and/or control of a single electron supported by the well known Heisenberg Uncertainty Principle places stringent limits on such single electron practice which are not addressed nor predictably overcome as instantly disclosed. Thus, the instant claims which are directed to "single electron" practice has not been

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instantly enabled thus supporting this rejection basis. Claims 13-29 also directly or via dependence cite "single electron" practice.

### **PRIOR ART**

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 13, 16, 17, 24, 26, and 27 are rejected under 35 U.S.C. 102(e)(2) as being clearly anticipated by Wang et al. (P/N 6,468,785).

Wang et al. discloses conductive DNA as previously set forth in the Office action, mailed 7/29/03. Such DNA polynucleotides may be arbitrarily divided into conductive segments as instantly claimed including being bare DNA segments as double stranded segments which are active grains due to being actively conductive. Thus, this reference anticipates the above instant claims for the same basis as previously set forth and further explained above. It is noted that the above rejection directed to 112, second paragraph, notes that the instant claims are unclear as to whether the DNA elements without a transistor functional structure are included in the claimed embodiments. Thus, a reference that cites the conductive DNA molecules with a bare, yet active grain, therein reasonably anticipates this interpretation of the instant claims. It is also noted

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that there is no specific definition of "active grain" as in instant claim 13 which excludes merely a conductive portion of a bare DNA from being included as an instant claim embodiment. Wang et al. was argued in REMARKS, filed 2/2/04, as being rendered moot due to newly added claims. This nonspecific argument is non-persuasive as not being directed to the factual basis for the rejection. Applicants further argue that Wang et al. indicates that a probe is not bonded to a conducting polymer. This argument is non-persuasive as double-stranded DNA as produced by hybridization in the Wang et al. disclosure as previously pointed to is well known to be conductive DNA as instantly claimed. Also, whether the DNA is or is not bonded to another element such as a conductive polymer is irrelevant to the basis for the rejection of the instant claims which are to be interpreted as broadly as reasonable which thus may or may not include other bonded or not elements.

Claims 13, 16, 17, 24, 26, and 27 are rejected under 35 U.S.C. 102(e)(2) as being clearly anticipated by Braun et al. (WO 99/04440).

Braun et al. discloses conductive DNA which forms a single electron transistor as previously set forth in the Office action, mailed 7/29/03. Such DNA polynucleotides include those being bare DNA segments as double stranded segments which are active grains. Thus, this reference anticipates the above instant claims for the same basis as previously set forth and further explained above. It is also noted that there is no specific definition of "active grain" as in instant claim 13 which excludes the DNA constructs of the reference from being included as an instant claim embodiment. Applicants argue in the REMARKS, filed 2/2/04, that the instantly claimed active grain is distinguished from

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the gate junction elements of the reference. A lack of definition of "active grain" in the instant disclosure fails to support this argument which thus supports this rejection due to bare DNA being disclosed in the structure of Braun et al. which may be interpreted as being an "active grain" of the instant invention.

No claim is allowed.

Papers related to this application may be submitted to Technical Center 1600 by facsimile transmission. Papers should be faxed to Technical Center 1600 via the Central PTO Fax Center. The faxing of such papers must conform with the notices published in the Official Gazette, 1096 OG 30 (November 15, 1988), 1156 OG 61 (November 16, 1993), and 1157 OG 94 (December 28, 1993)(See 37 CFR § 1.6(d)). The Central PTO Fax Center number is (703) 872-9306.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ardin Marschel, Ph.D., whose telephone number is (571) 272-0718. The examiner can normally be reached on Monday-Friday from 8 A.M. to 4 P.M.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Woodward, Ph.D., can be reached on (571) 272-0722.

Any inquiry of a general nature or relating to the status of this application should be directed to Legal Instrument Examiner, Tina Plunkett, whose telephone number is (571) 272-0549.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

September 19, 2004

*Ardin H. Marschel* 9/19/04  
ARDIN H. MARSCHEL  
PRIMARY EXAMINER